PERSONALITY AND INTERPERSONAL INFLUENCES ON AMBULATORY BLOOD PRESSURE IN COUPLES

by

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STATEMENT OF THESIS APPROVAL

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ABSTRACT

Research indicates that individual differences in aspects of negative affect are risk factors for cardiovascular disease. Further, few studies have examined effects of both the individual's own personality characteristics (i.e., actor effects) and the effects of a spouse's personality (i.e., partner effects), and scant research has adequately addressed the issue of general negative affect vs. isolated vs. partialled correlated personality traits. This study examined associations of ambulatory blood pressure (ABP) and self-report personality measures of composite (NA) and individual levels of anxiety, anger, and depression in 94 married couples. For actor effects, higher levels of NA predicted higher ambulatory systolic blood pressure (SBP) and diastolic blood pressure (DBP) for both genders (association in men's SBP was borderline significant). In isolated analyses of individual traits, anxiety predicted lower DBP in men but higher DBP in women. Depression similarly predicted higher women's SBP and DBP. In partialled analyses, the association of DBP with anxiety was significant in men, but not women. The associations of depression with SBP and with DBP were significant in women, but not men. Interestingly, a significant positive association emerged between anger and men's SBP. Analyses of partner effects revealed consistent gender differences. Higher partner levels of NA and individual traits significantly predicted higher SBP and DBP in men, but lower SBP and DBP in women. In partialled analyses of partner traits, parallel associations were significant for only wives' anger in men and

husbands' anxiety and anger women. In sum, actor and partner levels of NA and anxiety, anger, and depression are related to ABP, but associations with individual traits vary when traits are examined as a composite score, in isolation vs. in combination. Associations of actor and partner anxiety, anger, and depression with ABP demonstrate the importance of interpersonal processes in understanding psychosocial risk. However, a well-defined and thorough statistical conceptualization of these traits in future research will be necessary.

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CHAPTER 1

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death in the United States (American Heart Association (AHA), 2012). A number of psychosocial risk factors are implicated in the development and progression of CVD, including several aspects of emotional adjustment, personality characteristics, and related individual differences in social behavior (Everson-Rose & Lewis, 2005; Smith & Ruiz, 2002; Suls & Bunde, 2005). Central among these risk factors are symptoms of emotional distress and personality traits related to anxiety (Rouest, Martens, de Jonge, & Denollet, 2010), depression (Nicholson, Kuper, & Hemingway, 2006), and anger (Chida & Steptoe, 2009; Miller, Smith, Turner, Guijarro, & Hallet, 1996).

The present study addressed two issues in this research area. First, when examining associations of personality or aspects of emotional adjustment with CVD, researchers typically examine individual traits separately, without taking into account overlap among closely related characteristics. This study illustrated considerations for analysis of the broad, global trait of negative affectivity, as well as its components or facets, specifically anxiety, anger, and depression. Second, few researchers have examined intrapersonal and interpersonal psychosocial risk factors together, despite the fact that they often occur together. For example, in couples, anxiety, depression, and

anger can influence the individual's own health and well-being, as well as the health of their partner (Smith, Baron, & Grove, 2014). The present study examined this issue by testing both the actor and partner effects of these affective characteristics.

Negative Affective Traits and Cardiovascular Risk

In the past, researchers have examined individual risk factors in isolation of one another. However, this approach does not address the common issue of correlated risk factors. Psychosocial risk factors for CVD naturally overlap and aggregate both within and across personality characteristics and social behaviors (Smith & Cundiff, 2013).

This overlap is particularly true for the personality traits of anxiety, anger, and depression, all of which confer risk for CVD (Chida & Steptoe, 2009; Nicholson et al., 2006; Roest et al., 2010; Suls & Bunde, 2005). All three individual differences are consistently correlated, suggesting that measures of these traits may reflect a general individual difference in the broader trait of negative affectivity (Smith, 2010; Suls & Bunde, 2005). Negative affectivity is labeled as the neuroticism dimension in the Five-Factor Model (FFM) of personality (Costa & McCrae, 1992; Watson & Clark, 1984). A small number of studies have examined the potentially overlapping associations of individual facets of neuroticism with CVD. For example, Boyle and colleagues (2006) found that when examined in isolation, anxiety, anger, and depression are all associated with CVD risk. However, when these three traits were examined simultaneously, they were found to have intercorrelated rather than independent associations; a composite measure of negative affect was the strongest predictor of CVD. Thus, CVD risk may be associated with the broader negative affect dimension rather than with specific traits (Suls & Bunde, 2005).

However, other investigators have found distinctive features in these three traits despite the overlap. For example, Kubzansky et al. (2006) found that after accounting for the general distress common to all three traits, anxiety had an independent association with CVD. Grossardt et al. (2009) found an association between depression and all-cause mortality despite overlap with anxiety and anger. Similarly, Smith et al. (2008) found that anger and anxiety were independently associated with the severity of coronary artery disease, but depression was not. By simply observing the effects of more general personality constructs, one overlooks the possibility that specific traits may have distinct associations with CVD after controlling for overlap with other closely correlated traits (Kubzansky et al., 2006; Smith & Cundiff, 2013). Therefore, sole examination of a global trait of negative affectivity is incomplete, as more specific effects may also exist. However, because it may be more meaningful to study predictors in conjunction with one another rather than separately, overlapping associations still need to be considered (Smith & Cundiff, 2013).

The potential overlap between anxiety, anger, and depression can be addressed with simultaneous/combined analyses, which can reveal unique partialled associations of individual traits with CVD. However, this statistical approach poses a new problem of construct measurement described as "the perils of partialling" (Lynam et al., 2006). Partialling removes overlapping variance one variable shares with others. Consequently, the construct of original interest may no longer be captured in the same way, because the variance accounted for by the independent variable no longer includes variance of any closely related variables (Lynam et al., 2006; Smith, 2010). As discussed above, there is substantial overlap among anxiety, anger, and depression, and thus interpretations of composite, isolated, and partialled findings when considered separately are quite difficult.

Therefore, all three approaches are necessary for a complete picture of how anxiety, anger, and depression associate with CVD risk.

The Individual and the Social Context: An Actor-Partner Perspective

In addition to intrapersonal or individual-level psychosocial risk factors such as anger, anxiety, and depression (Chida & Steptoe, 2009; Suls & Bunde, 2005), several interpersonal or social-contextual characteristics predict CVD development and prognosis, such as low levels of perceived social support and social conflict (Barth, Schneider, & von Kanel, 2010; Everson-Rose & Lewis, 2005; Ewart, Taylor, Kraemer, & Agras, 1991; Kamarck et al., 2005; Smith & Ruiz, 2002). Social conflict also predicts CVD development and poor outcomes for patients with diagnosed CVD (De Vogli, Chandola, & Marmot, 2007; Orth-Gomer et al., 2000).

In the past, researchers have tended to conceptualize and study intrapersonal risk factors separately from interpersonal/social contextual risk factors. However, recent models describe intrapersonal and interpersonal risk factors as inherently interrelated, and possibly having overlapping effects on CVD (Smith et al., 2004; 2010; 2014). For example, in recurring social interactions and personal relationships, one person's personality is an important component of their partner's social context. In this way, personality traits are both intra- and interpersonal risk factors. In the interpersonal perspective (Costa & McCrae, 2011; Horowitz & Strack, 2011; Kiesler, 1996; Pincus & Ansell, 2013), an individual's affective experiences and expressive behaviors reciprocally influence the corresponding affective experiences and expressive behaviors of the interaction partner in on-going transactional cycles. In this general view, personality is both a characteristic of the individual, and through its expressive aspects, it is an

important aspect of the social context (Costa & McCrae, 2011; Sadler, Ethier, & Woody, 2011; Smith et al., 2010).

In the context of health, this model implies that individuals with certain personality characteristics, such as anxiety, anger, and depression (Smith & Ruiz, 2002), tend to face stressful environments due to the manner in which their traits and behaviors *elicit* negative reactions from others. These negative reactions from others in turn accentuate the individual's own internal experiences (Hammen, 2006; Smith et al., 2004). Thus, from this transactional/interpersonal perspective, interpersonal behavior is a manifestation of personality, and it has an impact on both the individual and the partner with whom the individual interacts. Therefore, a complete picture of the role of traits and social behaviors in CVD risk must take into account the traits and behaviors of our social partners.

Perhaps the most important social partner to consider is the spouse, given that marriage is arguably the most relevant relationship in most adults' lives (Karney & Bradbury, 2005). A number of personality characteristics associated with CVD risk are also associated with marital processes. For example, individuals with high levels of anxiety, anger, and depression report greater conflict with their spouses and lower overall marital quality (Baron et al., 2007; Kiecolt-Glaser & Newton, 2001; Renshaw, Blais, & Smith, 2010; Robles, Slatcher, Trombello, & McGinn, 2013; Smith et al., 2004). The fact that individuals with negative personality traits have poorer marital quality is important because marital conflict and poor marital quality have shown robust, independent associations with increased CVD risk (De Vogli, Chandola, & Marmot, 2007; Everson-Rose & Lewis, 2005; Holt-Lunstad, Birmingham, & Jones, 2008; Robles, et al., 2013; Smith, Uchino, Berg, & Florsheim, 2012). Additionally, researchers have found that

these associations can differ between men and women. For example, some studies have found women to have greater physiological changes (e.g., cardiovascular reactivity (CVR) and high-frequency heart rate variability (hf-HRV)) in response to marital conflict than men (Smith, Cribbet et al., 2011; Smith, Uchino et al., 2012), although this pattern does not characterize the literature as a whole and may differ across specific physiological outcomes (Robles et al., 2013).

Research also indicates that there are significant partner effects of personality on marital quality. For example, partner levels of the general negative affective trait of neuroticism, as well as more specific traits such as partner anger and partner depression, are associated with marital satisfaction (Malouff et al., 2010; Robins, Caspi, & Miffott, 2000; Renshaw, Blais, & Smith, 2010). Gender also plays a role in partner personality effects on marital quality. For example, Baron et al. (2007) found that husbands of high-anger wives reported lower marital satisfaction, but the wives of high-anger husbands did not.

While a number of studies have examined partner effects on marital processes, little research has considered how the personality traits of one's *partner* influence one's own CVD risk. One study of couples after coronary artery bypass surgery found that individuals with highly neurotic partners had increased postsurgical depression (Ruiz, Matthews, Scheier, & Schulz, 2006), which has been shown to be associated with poor CVD prognosis and recovery (Everson, Rose, & Lewis, 2005). Some studies have found gender differences in partner effects on CVD risk. For example, wives with hostile husbands have increased cardiovascular reactivity to stress (Smith & Gallo, 1999), whereas husbands with socially dominant wives have greater coronary artery calcification (CAC) (Smith et al., 2011). Trait hostility in husbands is also associated with higher

levels of other CVD risk factors in wives, such as increases in depression (Kiecolt-Glaser & Newton, 2001). Such findings suggest the potential value of considering partner effects in models of CVD risk, as well as gender differences.

The Present Study

The present study examined associations of negative affective traits with ambulatory blood pressure (ABP). ABP is a noninvasive measure of cardiovascular functioning in daily life (Pickering, Shimbo, & Haas, 2006) that researchers have demonstrated is a strong predictor of blood pressure and cardiovascular functioning (Pickering, Shimbo, & Haas, 2006; Shiffman, Stone, & Hufford, 2008) as well as CVD outcomes (Bjorklund, Lind, Zethelius, Berglund, & Lithell, 2004; Pickering, Shimbo & Haas, 2006; Prisant, Carr, Wilson, & Converse, 1990; Verdecchia, 2000). Evidence also suggests that ABP may be a mechanism through which personality and social behavior influence CVD risk (Ewart, Taylor, Kraemer, & Agras, 1991; Kamarck et al., 2005; Raikkonen, Matthews, Flory, Owens, & Gump, 1999).

The majority of published studies dealing with this issue have examined specific risk factors for CVD in isolation without accounting for possible overlap with other risk factors. Additionally, while there have been numerous studies of the impact of individuals' own characteristics, few studies have examined the effects of individuals' partners' personality on CVD risk. Therefore, our approach is novel in the following two ways. First, we conducted analyses of composite scores of negative affect; analyses of anxiety, anger, and depression examined in isolation; and combined analyses of anxiety, anger, and depression to examine unique associations. In this way, we were able to identify the overlapping and specific associations of aspects of negative affect with

cardiovascular risk. Second, we conducted these three types of analyses for both the actor and partner effects of these aspects of personality on ABP. Thus, we also were able to examine aspects of negative affect as both a traditional intrapersonal risk factor, and as an interpersonal or social-contextual risk factor.

Informed by prior research linking ABP to anxiety (Raikkonen, Matthews, Flory, Owens, & Gump, 1999), anger (Schum, 2003), and depression (Kario, Schwartz, Davidson, & Pickering, 2001; Shinagawa et al., 2002), we predicted that these aspects of negative affect would associate significantly with ABP. Prior research also links general negative affectivity to CHD risk (Boyle, Michalek, Suarez, 2006; Suls & Bunde, 2005), and we therefore predicted that the associations of anger, anxiety, and depression with ABP would overlap. However, examination of research available also led us to predict independent actor effects of anxiety and anger (Kubsanzky et al., 2006; Smith et al., 2008). Research on independent effects of partner traits on CVD is scarce, and provides insufficient guidance for predictions. Studies of independent partner effects on marital quality, however, suggest independent partner effects of anger and depression are likely (Renshaw, Blais, & Smith, 2010; Whisman, Weinstock, & Uebelacker, 2004). Finally, research suggests gender differences in the influence of partner personality on marital satisfaction (Baron et al., 2007), and marital quality (Smith, Cribbet et al., 2011; Smith, Uchino et al., 2012) and partner personality (Kieolt-Glaser & Newton, 2001; Smith et al., 2011) on CVD risk. We therefore predicted that actor and partner associations with ABP across all analyses would differ between men and women.

CHAPTER 2

METHOD

Participants

Cohabitating married couples were recruited through local newspaper advertisements, workplace newsletters, and flyers distributed throughout the Salt Lake City community. The following exclusion criteria were utilized: no existing hypertension, no cardiovascular prescription medication use, no history of chronic disease with a cardiovascular component, and no recent history of psychological disorder. Of 97 couples initially enrolled, 3 couples did not follow the study protocol and were eliminated, resulting in a total of 94 couples. For this final sample, mean age was 30.5 for men, and 28.5 for women, mean length of marriage was 6.8 years, 83% were White, 62.4% reported at least some college education, and 66% reported an income over $40,000 per year. Participants received $75, or extra course credit for participants enrolled in relevant University classes.

Study Protocol

Participants came to the laboratory in the morning hours and completed the Revised NEO Personality Inventory **(**NEO-PI-R; Costa & McCrae, 1992), and a demographic information questionnaire (i.e., age, race/ethnicity, income, education,

length of marriage). A Health-o-meter scale was used to measure height and weight. Participants were fitted with the ABP monitor by a trained research assistant and provided with detailed operating instructions, including removal instructions for the end of the day. Participants were additionally provided with a palm pilot device to record diary entries following each ABP reading, along with detailed instructions for use. One practice reading was obtained for each participant to ensure ABP monitor function and participants' understanding of the palm pilot use and how to complete diary entries.

Once the initial orientation appointment was complete, participants completed a 1-day ABP assessment. Typical hours were from 8am-10pm (M=14.01 h, SD=.97), including both working hours and hours at home interacting with the spouse within the same day. Random interval-contingent ABP monitor readings were collected within 30-minute intervals throughout the day, to minimize participants' alteration of regular activities in anticipation of BP readings. Participants were prompted to complete questions within 5 minutes of each reading (i.e., each cuff inflation) on a palm pilot device. These questions were preprogrammed using the Purdue Momentary Assessment Tool (Weiss, Beal, Lucy, & Macdermid, 2004), and asked for information regarding basic control variables relating to blood pressure (e.g., posture). After the 1-day ABP assessment was complete, participants returned to the laboratory the following day to return the equipment, receive compensation, and be debriefed.

Measures

The Oscar 2 (Suntech Medical Instruments, Raleigh, NC) was used to estimate ambulatory systolic blood pressure (SBP) and diastolic blood pressure (DBP). The Oscar

was developed to meet the reliability and validity standards of the British Hypertension Society Protocol (Goodwin, Bilous, Winship, Finn, & Jones, 2007). The cuff was worn under the participants' clothing, and only a small control box (approximately 5.0 X 3.5 X 1.5 in.) attached to the participant's belt was partially exposed. Outliers associated with artifactual readings were identified using the criteria by Marler, Jacob, Lehoczky, and Shapiro (1988). These included (a) SBP < 70 mmHg or > 250 mmHg, (b) DBP < 45 mmHg or > 150 mmHg, and (c) SBP/DBP < [1.065 + (.00125 X DBP)] or > 3.0.

We used an Ambulatory Diary Record (ADR) to assess for additional information at each ABP reading. Participants were instructed to complete a series of programmed questions on a palm pilot device following each ABP assessment. The ADR was designed to be completed within 2-3 minutes to facilitate ease of use and participant cooperation, and was divided into two sections. The ADR assessed basic factors that might influence ABP (Kamarck et al., 1998) such as posture (lying down, sitting, standing), activity level (1-4, 1 = no activity, 4 = strenuous activity), location (work, home, other), talking (no, yes), temperature (too cold, comfortable, too hot), prior exercise (no, yes), and prior consumption of nicotine, caffeine, alcohol, or a meal (no, yes). For each assessment occasion, participants also completed a 9-item measure of negative mood (i.e., "stressed", "irritated", "upset"). These items were summed to form an index of negative affect for each ABP measurement.

The ADR also assessed whether the participant was in the presence of his/her spouse (no, yes), and a series of questions asking for ratings from 1-5 about the quality of interactions with the spouse since the prior ABP measurement (i.e., ratings of intimacy, self-disclosure, spouse disclosure, influence, feelings understood, validated and accepted, and positivity, negativity, and mixed feelings).

To assess NA, anxiety, anger, and depression, participants completed the NEO-PI-R (Costa & McCrae, 1992). For the present analyses, three 8-item facet scales measured specific facets or components of neuroticism: anxiety (N1), angry hostility (N2), and depression (N3). High levels of internal consistency were found for all NEO scales within the current sample (all Cronbach's $\alpha > .70$).

CHAPTER 3

RESULTS

Analytic Strategy

Multilevel models were used to test the actor and partner scores of the neuroticism facets of anxiety, angry hostility, and depression, as well as a composite score of the items from these scales (total NA) on ABP. We examined these effects separately (isolated analyses), and then concurrently (combined analyses) to evaluate their independent effects. The primary analysis utilized PROC MIXED in SAS (version 9.1.3), which uses a random effects regression model to derive parameter estimates both within and across individuals (Singer, 1998). All factors were treated as fixed, as PROC MIXED treats unexplained variation within individuals as a random factor. We modeled individuals (i.e., husband and wife) within a dyad and measurement occasion (ie., reading number) as repeated factors using the autoregressive compound symmetry covariance structure ("type = un@ar(1)"). This model (Campbell & Kashy, 2002) allows examination of risk factors and individual and interpersonal factors while controlling the dependency within married couples and measurement occasions. We used Satterthwaite approximation to determine appropriate degrees of freedom.

Gender Interactions

As discussed, previous studies suggest that actor and partner personality associations with CHD vary by gender. We therefore modeled gender interactions directly, and found a trend of significance and borderline significance. Table 1 summarizes our gender interaction findings.

Gender Interactions: Actor Effects

The following outlines results for analyses of gender interactions with actor general negative affectivity (NA), isolated analyses of anxiety, anger, and depression, and combined analyses of anxiety, anger, and depression.

General Negative Affectivity (NA)

Gender interacted significantly with actor NA in both SBP and DBP outcomes.

Isolated Analyses of Negative Affective Traits

Gender interacted significantly with actor anxiety in DBP but not SBP outcomes, and with actor depression for both ABP outcomes. No significant gender interactions were found with actor anger for either ABP in isolated analyses.

Isolated Analyses of Negative Affective Traits

Gender interacted significantly with actor anxiety in DBP but not SBP outcomes, and with actor depression for both SBP and DBP outcomes. No significant gender interactions were found with actor anger for either SBP or DBP outcomes in isolated analyses.

Table 1

Gender interactions of actor and partner negative affective traits' associations with blood pressure.

Systolic Blood Pressure (SBP) Outcomes							
		Isolated Analyses			**Combined Analyses**		
Effect	**NA**	**Anxiety**	**Anger**	**Depression**	**Anxiety**	**Anger**	**Depression**
Actor x Gender	2.7(1.5)*	1.7(1.4)	-.99(1.3)	3.5(1.2)**b**	.44(1.8)	-4.4(1.6)**b**	5.7(1.6)**c**
Partner x Gender	-9.2(1.5) **d**	-7.3(1.4)**d**	-7.7(1.3)**d**	-5.5(1.2)**d**	-3.4(1.9)*	-6.4(1.6)**d**	-.48(1.7)
Diastolic Blood Pressure (DBP) Outcomes							
		Isolated Analyses			**Combined Analyses**		
Effect	**NA**	**Anxiety**	**Anger**	**Depression**	**Anxiety**	**Anger**	**Depression**
Actor x Gender	3.7(.97)**c**	2.9(.87)**c**	1.3(.83)	2.8(.77)**c**	1.9(1.2)*	-1.3(1.0)	2.4(1.1)**a**
Partner x Gender	-6.7(.97)**d**	-4.9(.88)**d**	-6.7(.83)**d**	-2.9(.79)**c**	-2.4(1.2)*	-7.2(1.0)**d**	1.9(1.1)*

a = *p*< .05; b = *p* < .01; c = *p* < .001; d = *p* < .0001; * = *p* <.1

Combined Analyses of Negative Affective Traits

In combined analyses, we found gender interacted significantly with actor anxiety in DBP but not SBP outcomes, with actor anger in SBP but not DBP outcomes, and with actor depression in both SBP and DBP outcomes.

Gender Interactions: Partner Effects

The following outlines results for analyses gender interactions with partner general negative affectivity (NA), isolated analyses of partner anxiety, partner anger, and partner depression, and combined analyses of partner anxiety, partner anger, and partner depression.

General Negative Affectivity (NA)

We found that gender interacted significantly with partner NA in both SBP and DBP outcomes.

Isolated Analyses of Negative Affective Traits

In isolated analyses of both SBP and DBP outcomes, gender interacted significantly with partner anxiety, partner anger, and partner depression.

Isolated Analyses of Negative Affective Traits

Gender interacted significantly with actor anxiety in DBP but not SBP outcomes, and with actor depression for both SBP and DBP. No significant gender interactions were found with actor anger for either SBP or DBP in isolated analyses.

Combined Analyses of Negative Affective Traits

In combined analyses of both SBP and DBP outcomes, gender interacted significantly with partner anxiety and with partner anger. Gender interacted significantly with partner depression in DBP but not SBP outcomes.

Results in Men vs. Women

Overall, we found the majority of gender interactions to be statistically significant. This indicates that in our sample, the influence of actor and partner negative affect on ABP differed significantly between men and women. We therefore examined associations of actor or partner levels of each trait with ABP in males vs. females using both isolated and combined analyses. We utilized a two-intercept model approach to simultaneously estimate actor and partner effects in men vs. women. Table 2 summarizes our male and female findings for each set of analyses. We then outline results, reporting first NA, isolated, and combined analyses of actor effects of negative affective traits in men, then women. We then repeat this structure in our report of partner effects.

Actor Analyses

General Negative Affectivity (NA) and Men's ABP

Men low in NA had significantly higher DBP. We did not find a significant association between men's NA and SBP.

Table 2

Male and female actor and partner effects of negative affected traits on blood pressure.

Systolic Blood Pressure (SBP) Outcomes							
		Isolated Analyses			**Combined Analyses**		
Effect	**NA**	**Anxiety**	**Anger**	**Depression**	**Anxiety**	**Anger**	**Depression**
Males-Actor	0.19(1.12)	-0.10(1.0)	1.55(.88)	-.41(.90)	-0.13(1.39)	2.77(1.04)**b**	-2.28(1.23)
Females-Actor	2.88(1.01)**b**	1.63(.88)	0.55(.95)	3.12(.79)**d**	0.31(1.25)	-1.62(1.19)	3.41(1.03)**c**
Males- Partner	5.46(1.09)**d**	4.120(.95)**d**	5.78(1.02)**d**	2.64(.88)**b**	1.91(1.37)	5.63(1.31)**d**	-1.06(1.17)
Females-Partner	-3.77(1.04)**c**	-3.13(.97)**b**	-1.93(.84)**a**	-2.88(.84)**c**	-1.45(1.34)	-0.81(.99)	-1.54(1.20)
Diastolic Blood Pressure (DBP) Outcomes							
	NA	**Isolated Analyses**			**Combined Analyses**		
Effect	**NA**	**Anxiety**	**Anger**	**Depression**	**Anxiety**	**Anger**	**Depression**
Males: Actor	-1.50(.63)**a**	-1.59(.63)**a**	-.45(.53)	-.86(.55)	-1.78(.84)**a**	.72(.62)	-.58(.75)
Females: Actor	2.23(.70)**b**	1.36(.61)**a**	.91(.65)	1.89(.55)**c**	0.16(.85)	-.63(.81)	1.82(.70)**b**
Males: Partner	3.90(.66)**d**	2.40(.57)**d**	4.6(.61)**d**	1.82(.53)**c**	-0.12(.82)	5.16(.78)**d**	-.58(70)
Females: Partner	-2.79(.71)**d**	-2.52(.67)c	-2.15(.57)**c**	-1.16(.58)**a**	-2.49(.91)**b**	-2.07(.68)**b**	1.40(.82)

a = < .05; b = < .01; c = < .001; d = < .0001

Isolated Analyses of Negative Affective Traits and Men's ABP

Isolated analyses of anxiety, anger, and depression revealed that men low in anxiety had higher diastolic blood pressure (DBP). We did not find a significant association between men's anxiety and SBP. No significant actor effects for anger or depression were found in isolated analyses for either SBP or DBP.

Combined Analyses of Negative Affective Traits and Men's ABP

In combined analyses, we found that men low in anxiety had higher DBP, and no significant association was found between men's anxiety and SBP. Nor were significant associations found between men's depression and SBP or DBP. Interestingly, a significant association between anger and SBP emerged in combined analyses. We found that men higher in anger had higher SBP, a finding that was not present in isolated analyses.

General Negative Affectivity (NA) and Women's ABP

Women high in NA had significantly higher SBP and DBP.

Isolated Analyses of Negative Affective Traits and Women's ABP

In isolated analyses, women high in anxiety had significantly higher DBP, but not SBP, and women high in depression had higher SBP and DBP. No significant associations were found between women's anger and SBP and DBP.

Combined Analyses of Negative Affective Traits and Women's ABP

In combined analyses, only associations between depression and SBP and DBP in women were statistically significant.

Partner Analyses

Partner General Negative Affectivity (NA) and Men's ABP

Men with wives high in NA had significantly higher SBP and DBP than men whose wives had lower NA.

Isolated Analyses of Partner Negative Affective Traits and Men's ABP

In isolated analyses, men with wives high in anxiety, anger, and depression had significantly higher SBP and DBP.

Combined Analyses of Partner Negative Affective Traits and Men's ABP

In combined analyses, only men whose wives were higher in anger had significantly higher SBP and DBP. Combined analyses of partner effects showed that only partner anger was positively associated with SBP and DBP in men. Therefore, men with wives higher in anger had higher SBP and DBP.

Partner General Negative Affectivity (NA) and Women's ABP

Women with husbands low in total NA had significantly higher SBP and DBP.

Isolated Analyses of Negative Affective Traits and Women's ABP

Isolated analyses of partner effects showed that partner anxiety, anger, and depression were negatively associated with SBP and DBP in women. In other words, women with husbands low in anxiety, anger, and depression had higher SBP and DBP.

Combined Analyses of Negative Affective Traits and Women's ABP

In combined analyses, we found significant associations only for only partner anxiety and partner anger with DBP. No significant associations were found between partner negative affective traits and women's SBP.

CHAPTER 4

DISCUSSION

This study had three primary aims. First, we aimed to determine whether a general trait or specific affective traits more accurately represent influence on ABP. Specifically, we examined associations between ambulatory blood pressure (ABP) with composite scores for general negative affect (total NA), and with individual scores of anxiety, anger, and depression in both isolated and combined analyses. Our second aim was to examine associations between actor or partner levels of the these three traits to fully explore the role of personality traits and social behaviors in CVD risk, Finally, we sought to determine if these associations differ by gender.

The current literature suggests that the relationship between negative affect and relationship satisfaction differs between men and women (Baron et al., 2007), as does the relationship between negative affective traits and cardiovascular health (Kiecolt-Glaser & Newton, 2001; Smith & Gallo, 1999). We therefore directly examined gender interactions within each set of analyses, and found a general trend in which associations between ABP and both actor and partner negative affective traits differed significantly between men and women. (Please see Table 1 for a summary of gender interactions.) We therefore proceeded to examine the influence of both actor and partner negative affect on ABP in men vs. women.

Actor Effects

In analyses of actor negative affective traits in men, we found no association between systolic blood pressure (SBP) and total NA, isolated anxiety, anger, or depression. However, in combined analyses of the three individual traits, a significant positive association between anger and SBP emerged as statistically significant, indicating that men who are higher in anger have higher SBP. Importantly, this association of anger with SBP was obscured when anger was considered separately, suggesting that its shared variance with anxiety and depression masked an association of the more specific, "partialled" measure of anger with ambulatory SBP.

In contrast to SBP, we found a significant inverse association between men's total NA and DBP. Further, in isolated analyses of anxiety, anger, and depression, we found a statistically significant inverse association between diastolic blood pressure (DBP) and anxiety, but not with anger or depression. This inverse association between anxiety and DBP was also statistically significant in combined analyses. Thus, for men, our findings suggest a difference between SBP and DBP. Specific effects of anger appear to influence SBP in a manner that might be expected: angrier men are likely to have higher SBP levels. In contrast, total NA indicated an inverse association with DBP. Isolated and combined analyses further specified that anxiety, not the overlap of the negative affective traits, accounted for this effect in men.

Results were quite different for women. Examination of total NA indicated a positive relationship with both SBP and DBP. In isolated analyses, a statistically significant positive association remained for both anxiety and depression (with the exception of the association between anxiety and women's SBP). Finally, when we

forced anxiety, anger, and depression together in combined analyses, only the associations between depression and SBP and DBP were statistically significant. In this case, when variance overlap shared by anxiety and depression was removed, anxiety was no longer significant. Thus, our findings implicate depression as the more important predictor of ABP in women.

Our findings for actor effects highlight the potential problems of the examination of total NA alone, as well as demonstrate how isolated analyses and combined analyses in which traits are forced to be independent allow for more specificity. Our finding that men with higher anger have higher SBP would not have been uncovered if the traits of anxiety, anger, and depression had not been forced into combined analysis, in which anger was trimmed of overlapping variance with anxiety and depression. The same issue presents itself in our findings that specifically anxiety and not general negative affect accounted for lower DBP in men. Similarly, specifically depression, and not general negative affect or overlap between anxiety and depression, accounted for higher SBP and DBP in women. However, it is important not to forget the "perils of partialling" (Lynam et al., 2006; Smith, 2010) when considering the results of isolated and combined analyses. Interestingly, of all the significant associations we found between men's personality and men's ABP, the only positive association was with men's anger in combined analyses. Our findings suggest that in men, when left in its "natural" state in which overlap of anger with anxiety and depression exists, anger has little association with ABP. However, when shed of this overlap, anger became a significant risk factor. These two versions of anger thus represent different constructs, and because the independent effect of anger after partialling is quite different from when anger was considered separately, this partialled predictor should be interpreted with caution. In

contrast, significant associations between ABP and men's anxiety and women's depression in isolated vs. combined analyses were quite similar. Therefore, we can conclude with more confidence that men's anxiety and women's depression, whether or not shed of overlap with other traits, are independent predictors of ABP. Unfortunately, because few studies have assessed both isolated and partialled risk variables, issues of overlap and construct are often overlooked.

To summarize actor effects results, we found that for men, anger had a positive relationship with SBP, while anxiety had an inverse relationship with DBP. A number of previous studies have found an association between anger in men and cardiovascular health (Chida & Steptoe, 2009; Miller et al., 1996; Smith, Glazer, Ruiz, & Gallo, 2004). However, our finding that men's anxiety and cardiovascular risk are inversely related is inconsistent with the current literature (Everson-Rose & Lewis, 2005; Smith & Ruiz, 2002). For women, findings suggest that the association between negative affective traits and ABP appears to reflect their own depression, a hypothesis that is consistent with previous studies (Everson-Rose & Lewis, 2005; Smith & Ruiz, 2002).

Partner Effects

Examination of gender interactions within partner effects also highlighted differences between men and women in how negative affective traits influence ABP. Significant or borderline significant interactions were found for all traits, with the exception of partner depression and SBP in combined analyses. We therefore examined the influence of negative affective traits on ABP in men vs. women. In men, partner total NA was significantly associated with both SBP and DBP, as were partner anxiety, anger, and depression in isolated analyses. However, in combined analyses, when forcing

partner anxiety, anger, and depression to compete, partner anger was significant for both men's SBP and DBP, but no significant associations were found for partner anxiety or depression. Thus, wives' trait anger was the most important spouse predictor of husbands' ABP.

In women, a very different trend emerged in which partner NA had a significant protective (inverse) association with both SBP and DBP, as did partner anxiety, anger, and depression. However, when partner anxiety, anger, and depression were forced to compete in combined analyses, associations with SBP compared to DBP were no longer similar. All associations with SBP became statistically insignificant, while significant associations with DBP remained for both partner anxiety and partner anger. These results indicate that for women, the overlapping variance of these partner traits (i.e., partner total NA) had a protective/positive association with SBP. In contrast, for DBP, it appears the protective effect was specifically found in partner anxiety and partner anger.

Again, our results on partner effects in men and women demonstrate the necessity of conducting all three types of statistical analyses. If only total NA had been examined, specific effects of partner anger on men's SBP and DBP, and effects of partner anxiety and partner anger on women's DBP, would have been missed. On the other hand, if only combined analyses had been conducted, the effect of the shared variance of total partner NA on women's SBP would have also been overlooked. Therefore, a single approach in which one always forces traits to compete is insufficient due to "the perils of partialling."

Overall, results suggest that men with angry wives tend to have higher ABP. In contrast, women with husbands high in general negative affectivity had lower SBP, suggesting that general negative affect common to the three specific partner personality traits is perhaps a protective factor associated with CHD risk in women's SBP. Our

results also indicated that women's DBP is negatively influenced specifically by higher levels of anxiety and anger in their husbands.

Our findings both align and contradict with the large existing literature on partner effects of neuroticism and negative affect on relationship quality. A number of studies, including a meta-analysis, have found low partner neuroticism to significantly predict relationship satisfaction (Malouff et al., 2010), which is consistent with the relational trends we found between partner personality and ABP for men, but not women. Renshaw, Blais, and Smith (2010) found that of the individual negative affective traits of anxiety, anger, and depression, only partner anger had a significant negative effect on marital satisfaction. We similarly found partner anger to significantly predict higher ABP in men, but in contrast, lower DBP in women.

A small number of studies exist for comparison our findings on the influence of partner negative affective traits on ABP. Some CVD studies have examined partner levels of hostility and dominance, and found that partner dominance was more salient to men's cardiovascular functioning than women's (Smith et al., 2011) and hostility more salient to women's cardiovascular functioning than men's (Smith & Brown, 1991; Smith & Gallo, 1999). However, no studies to date examine gender differences in associations between partner levels of negative affective traits (specifically anxiety, anger, and depression) and cardiovascular functioning.

It may appear counter-intuitive that higher levels of negative affect in male partners are associated with lower ABP in women. However, we propose that this pattern might be explained in the context of demand/withdraw interaction patterns in spouses. A number of studies have demonstrated that the demand-withdraw sequence is associated with marital distress (Eldridge & Christensen, 2002; Eldridge, Sevier, Jones, Atkins, &

Christensen, 2007). In marital relationships, this pattern typically manifests as women engaging in demand behavior and men engaging in withdraw behavior (Christensen & Shenk, 1991). One interpretation for this behavioral pattern lies in interpersonal theories. These theories posit that men tend to be relationally driven by agency (i.e., the motivation to be independent and focused on the self), while women tend to be relationally driven by communion (i.e., motivated to form connections and unions and focus on the group; Helgeson, 1994). Thus, partner withdraw behavior (i.e., noncommunal behavior) may cause distress in women. Studies have also shown that women have stronger norepinephrine and cortisol responses to this interaction pattern than men (Heffner et al., 2006; Kiecolt-Glaser et al., 1996). We speculate that higher levels of negative affect in men may signal to women higher levels of engagement in the relationship and mitigate fears of threat to communion, which may potentially outweigh detrimental effects of partner negative affect.

Acknowledging the potential overlap of these traits has important treatment implications. Communalities have been found among a number of anxiety and major emotional disorders, particularly in terms of comorbidity and response to specific treatments (Barlow et al., 2013). Studies also indicate that general negative affectivity interferes with the outcome of cardiac rehabilitation programs (Cameron, Petrie, Ellis, Buick, & Weinman, 2005). However, identification and acknowledgement of individual risk factors also has treatment implications, as has been demonstrated in the case of hostility. Investigators have demonstrated that hostility is the "toxic" component of the Type A behavioral pattern that associates with CHD development and progression (Chida & Steptoe, 2009; Hecker, Chesney, Black, & Frautchi, 1988). As a consequence, researchers are beginning to demonstrate the benefits of addressing hostility in

interventions (Davidson, Gidron, Mostofsky, & Trudeau, 2007; Gidron, Davidson, & Bata, 1999; Kamarck et al., 2009). Similarly, our results suggest potential toxic but also protective components of actor and partner anxiety, anger, and depression. The present study successfully brought the issue of isolated risk factors to the next level by examining the potency of these components in specific contexts- specifically, how do they differ by source (actor vs. partner) and by gender? As mentioned above, our results suggest that for men, toxic components for ABP include anger, and partner anger, while anxiety appears to be protective. For women, results suggest depression is toxic for ABP, while partner anxiety and depression appear protective.

Limitations

There are several limitations to the present study. While examination of ABP allows for greater ecological validity than clinic blood pressure readings (Pickering, Shimbo, & Haas, 2006), ABP studies are weaker in experimental control, and can only provide information regarding patterns among negative affective traits and cardiovascular function to help guide future experimental and intervention studies. In spite of these limitations, the study possesses a number of strengths. Perhaps most importantly, it addresses SBP, which has been identified as a strong predictor of cardiovascular disease (CVD) for both men and women (Mason et al., 2004; Psaty et al., 2001). ABP is also a valuable endpoint: it is more accurate and effective at diagnosing hypertension and determining the appropriate intervention than clinic blood pressure readings (Hodgkinson et al., 2011), and is also an important independent predictor of incident cardiovascular disease (Bjorklund, Lind, Zethelius, Berglund, & Lithell, 2004; Hansen, Jeppesen, Rasmussen, Ibsen, & Torp-Pedersen, 2006; Verdaccia, 2000). Thus, there are important

health implications of studies focusing on the consequences of actor and partner negative affective traits on ABP.

CHAPTER 5

CONCLUSIONS

In the past, researchers have traditionally studied personality traits separately, often with little regard for how intrapersonal and interpersonal traits are connected or how individual traits may overlap (Smith & Mackenzie, 2006). The current study demonstrates the value of using a social context framework, particularly the social context of a partner's personality, when considering associations of personality with ABP. Our results suggest that not only is an individual's own personality relevant to ABP levels, an individual's partner's personality is as well, and in ways unique to men and women. In addition, our work highlights the importance of considering both overlap and independent effects of individual personality traits, as the present findings revealed both kinds of associations between ABP and individual negative affective traits that are often observed in isolation. Awareness of the social context and the nuanced nature of independent and overlapping personality traits will help to inform interventions focused on preventing and coping with cardiovascular disease and other chronic health conditions.

REFERENCES

American Heart Association (2012). Heart disease and stroke statistics: 2012 update. *Circulation, 125*, e2-e220.

Barlow, D.H., Sauer-Zavala, S., Carl, J.R., Bullis, J.R., & Ellard, K. K. (in press) The nature, diagnosis, and treatment of neuroticism: Back to the future. *Clinical Psychological Science, online.*

Baron, K. G., Smith, T. W., Butner, J., Nealey-Moore, J., Hawkins, M. W., & Uchino, B. N. (2007). Hostility, anger, and marital adjustment: Concurrent and prospective associations with psychosocial vulnerability. *Journal of Behavioral Medicine, 30*, 1-10.

Barth, J., Schneider, S., & von Känel, R. (2010). Lack of social support in the etiology and the prognosis of coronary heart disease: A systematic review and meta-analysis. *Psychosomatic Medicine, 72*, 229-238.

Bjorklund, K., Lind, L., Zethelius, B., Berglund, L., & Lithell, H. (2004). Prognostic significance of 24-h ambulatory blood pressure characteristics for cardiovascular morbidity in a population of elderly men. *Journal of Hypertension, 22*, 1691-1697.

Boyle, S.H., Michalek, J.E., & Suarez, E.C. (2006). Covariation of psychological attributes and incident coronary heart disease in U.S. Air Force veterans of the Vietnam war. *Psychosomatic Medicine, 68,* 844-850.

Cameron, L. D., Petrie, K. J., Ellis, C. J., Buick, D., & Weinman, J. A. (2005). Trait negative affectivity and responses to a health education intervention for myocardial infarction patients. *Psychology & Health, 20*, 1-18.

Campbell, L., & Kashy, D. A. (2002). Estimating actor, partner, and interaction effects for dyadic data using PROC MIXED and HLM: A user–friendly guide. *Personal Relationships, 9*, 327-342.

Chida, Y., & Steptoe, A. (2009). The association of anger and hostility with future coronary heart disease: A meta-analytic review of prospective evidence. *Journal of the American College of Cardiology, 53*, 774-778.

Christensen, A., & Shenk, J. L. (1991). Communication, conflict, and psychological distance in nondistressed, clinic, and divorcing couples. *Journal of Consulting and Clinical Psychology, 59*, 458.

Costa, P.T., Jr., & McCrae, R.R. (1992). *Professional manual: Revised NEO Personality Inventory (NEO-PI-R) and the NEO Five-Factor Inventory (NEO-FFI).* Odessa, FL: Psychological Assessment Resources.

Costa, P.T., Jr., & McCrae, R.R. (2011). The Five-Factor Model, Five Factor Theory, and interpersonal psychology. In L. M. Horowitz & S. Strack (Eds.), *Handbook of interpersonal psychology* (pp. 91-104). Hoeboken, NJ: Wiley.

Davidson, K. W., Gidron, Y., Mostofsky, E., & Trudeau, K. J. (2007). Hospitalization cost offset of a hostility intervention for coronary heart disease patients. *Journal of Consulting and Clinical Psychology, 75*, 657.

De Vogli, R., Chandola, T., & Marmot, M.G. (2007). Negative aspects of close relationships and heart disease. *Archives of Internal Medicine, 167*, 1951-1957.

Eldridge, K. A., & Christensen, A. (2002). Demand-withdraw communication during couple conflict: A review and analysis. In P. Noller & J.A. Feeney (Eds.), *Understanding marriage: Developments in the study of couple interaction* (pp. 289-322). Cambridge, UK: Cambridge University Press.

Eldridge, K. A., Sevier, M., Jones, J., Atkins, D. C., & Christensen, A. (2007). Demand-withdraw communication in severely distressed, moderately distressed, and nondistressed couples: Rigidity and polarity during relationship and personal problem discussions. *Journal of Family Psychology, 21*, 218.

Everson-Rose, S.A., & Lewis, T.T. (2005). Psychosocial factors and cardiovascular diseases. *Annual Review of Public Health, 26*, 469-500.

Ewart, C.K., Taylor, C.B., Kraemer, H.C., & Agras, W.S. (1991). High blood pressure and marital discord: Not being nasty matters more than being nice. *Health Psychology, 10,* 155-163.

Fournier, M. A., Moskowitz, D. S., & Zuroff, D. C. (2011). Origins and applications of the Interpersonal Circumplex. In L. M. Horowitz & S. Strack (Eds.), *Handbook of interpersonal psychology: Theory, research, assessment, and therapeutic interventions* (pp. 57-74). Hoboken, NJ: John Wiley & Sons, Inc.

Frasure-Smith, N., & Lespérance, F. (2003). Depression and other psychological risks following myocardial infarction. *Archives of General Psychiatry*, *60*(6), 627-636.

Goodwin, J., Bilous, M., Winship, S., Finn, P., & Jones, S.C. (2007). Validation of the Oscar 2 oscillometric 24-h ambulatory blood pressure monitor according to the British Hypertension Society Protocol. *Blood Pressure Monitoring, 12,* 113–117.

Grossardt, B.R., Bower, J.H., Geda, Y.E, Colligan, R.C., & Rocca, W.A. (2009). Pessimistic, anxious, and depressive personality traits predict all-cause mortality: The Mayo Clinic Cohort Study of personality and aging. *Psychosomatic Medicine, 71*, 491-500.

Hammen, C. (2006). Stress generation in depression: Reflections on origins, research, and future directions. *Journal of Clinical Psychology, 62*, 1065-1082.

Hansen, T. W., Jeppesen, J., Rasmussen, S., Ibsen, H., & Torp-Pedersen, C. (2006). Ambulatory blood pressure monitoring and risk of cardiovascular disease: A population based study. *American Journal of Hypertension, 19*, 243-250.

Hecker, M. H., Chesney, M. A., Black, G. W., & Frautschi, N. (1988). Coronary-prone behaviors in the Western Collaborative Group Study. *Psychosomatic Medicine, 50*, 153-164.

Heffner, K. L., Loving, T. J., Kiecolt-Glaser, J. K., Himawan, L. K., Glaser, R., & Malarkey, W. B. (2006). Older spouses' cortisol responses to marital conflict: Associations with demand/withdraw communication patterns. *Journal of Behavioral Medicine, 29*, 317-325.

Helgeson, V. S. (1994). Relation of agency and communion to well-being: Evidence and potential explanations. *Psychological Bulletin, 116*, 412.

Hodgkinson, J., Mant, J., Martin, U., Guo, B., Hobbs, F. D. R., Deeks, J. J., ... McManus, R. J. (2011). Relative effectiveness of clinic and home blood pressure monitoring compared with ambulatory blood pressure monitoring in diagnosis of hypertension: A systematic review. *BMJ: British Medical Journal, 342*, 1-17.

Holt-Lundstad, J., Birmingham, W., & Jones, B.Q. (2008). Is there something unique about marriage? The relative impact of marital status, relationship quality, and network social support on ambulatory blood pressure and mental health. *Annals of Behavioral Medicine, 35*, 239-244.

Horowitz, L.M., & Strack, S. (2011). *Handbook of interpersonal psychology*. Hoeboken, NJ: Wiley.

Houston, B.K., Chesney, M., Black, G., Cates, D., & Hecker, M. (1992). Behavioral clusters and coronary heart disease risk. *Psychosomatic Medicine, 54*, 447-461.

Janicki-Deverts, D., & Kamarck, T.W. (2008). Ambulatory blood pressure monitoring. In L.J. Lueken & L.G. Gallo (Eds.), *Handbook of physiological research methods in health psychology* (pp. 159-182). Thousand Oaks, CA: Sage.

Kamarck, T. W., Haskett, R. F., Muldoon, M., Flory, J. D., Anderson, B., Bies, R., ... Manuck, S. B. (2009). Citalopram intervention for hostility: Results of a randomized clinical trial. *Journal of Consulting and Clinical Psychology, 77*, 174.

Kamarck, T.W., Janicki, D.L., Shiffman, S., Polk, D.E., Muldoon, M.F., Liebenauer, L.L., & Schwartz, J.E. (2002). Psychosocial demands and ambulatory blood pressure: A field assessment approach. *Physiology & Behavior, 77*, 699-704.

Kamarck, T.W., & Lovallo, W.R. (2003). Cardiovascular reactivity to psychological challenge: Conceptual and measurement considerations. *Psychosomatic Medicine, 65*, 9-21.

Kamarck, T. W., Shiffman, S. M., Smithline, L., Goodie, J. L., Paty, J. A., Gnys, M., & Jong, J. Y. K. (1998). Effects of task strain, social conflict, and emotional activation on ambulatory cardiovascular activity: Daily life consequences of recurring stress in a multiethnic adult sample. *Health Psychology, 17*, 17.

Kamarck, T.W., Schwartz, J.E., Shiffman, S., Muldoon, M.F., Sutton-Tyrrell, K., & Janicki, D.L. (2005). Psychosocial stress and cardiovascular risk: What is the role of daily experience? *Journal of Personality, 73*, 1749-1774.

Kario, K., Schwartz, J.E., Davidson, K.W., & Pickering, T.G. (2001). Gender differences in assocations of diurnal blood pressure variation, awake-physical activity, and sleep quality with negative affect: The work site blood pressure study. *Hypertension, 38*, 997-1002.

Karney, B.R., & Bradbury, T.N. (2005). Contextual influences in marriage: Implications for policy and intervention. *Current Directions in Psychological Science, 14*, 171-174.

Kiecolt-Glaser, J.K., & Newton, T.L. (2001). Marriage and health: His and hers. *Psychological Bulletin, 127*, 472-503.

Kiesler, D.J. (1996). *Contemporary interpersonal theory and research: Personality, psychopathology, and psychotherapy.* New York: Wiley.

Kubzansky, L.D., Cole, S.R., Kawachi, I., Vokonas, P., & Sparrow, D. (2006). Shared and unique contributions of anger, anxiety, and depression to coronary heart disease: A prospective study in the Normative Aging Study. *Annals of Behavioral Medicine, 31*, 21-29.

Locke, K. D. (2011). Circumplex measures of interpersonal constructs. In L. M. Horowitz & S. Strack (Eds.), *Handbook of interpersonal psychology: Theory, research, assessment, and therapeutic interventions* (pp. 313-324). Hoboken, NJ: John Wiley & Sons, Inc.

Lynam, D.R., Hoyle, R.H., & Newman, J.P. (2006). The perils of partialling; cautionary tales from aggression and psychopathy. *Assessment, 12*, 328-341.

MacMahon, S. (2000). Blood pressure and the risk of cardiovascular disease. *New England Journal of Medicine, 342*, 50-52.

MacMahon, S., Peto, R., Cutler, J., Collins, R., Sorlie, P., Neaton, J., … Stamler, J. (1990). Blood pressure, stroke, and coronary heart disease: Part 1. Prolonged differences in blood pressure: Prospective observational studies corrected for the regression dilution bias. *Lancet, 335*, 765-774.

Malouff, J.M., Thorsteinsson, E.B., Schutte, N.S., Bhullar, N., & Rooke, S.E. (2010). The Five-Factor Model of personality and relationship satisfaction of intimate partners: A meta-analysis. *Journal of Research in Personality, 44*, 124-127.

Marler, M. R., Jacob, R. G., Lehoczky, J. P., & Shapiro, A. P. (1988). The statistical analysis of treatment effects in 24-hour ambulatory blood pressure recordings. *Statistics in Medicine, 7*, 697-716.

Mason, P. J., Manson, J. E., Sesso, H. D., Albert, C. M., Chown, M. J., Cook, N. R., ... Glynn, R. J. (2004). Blood pressure and risk of secondary cardiovascular events in women: The Women's Antioxidant Cardiovascular Study (WACS). *Circulation, 109*, 1623-1629.

Miller, T.Q., Smith, T.W., Turner, C.W., Guijarro, M.L., & Hallett, A.J. (1996). A meta-analytic review of research on hostility and physical health. *Psychological Bulletin, 119*, 322-348.

Nicholson, A., Kuper, H., & Hemingway, H. (2006). Depression as an aetiologic and prognostic factor in coronary heart disease: A meta-analysis of 6,362 events among 146,538 participants in 54 observational studies. *European Heart Journal, 27*, 2763– 2774.

Orth-Gomer, K., Wamala, S. P., Horsten, M., Schenck-Gustafsson, K., Schneiderman, N., & Mittleman, M. A. (2000). Marital stress worsens prognosis in women with coronary heart disease: The Stockholm Female Coronary Risk Study. *JAMA, 284*, 3008-3014.

Pickering, T., Harchfield, G., Devereux, R., & Laragh, J. (1983). What is the role of ambulatory blood pressure monitoring in the management of hypertensive patients? *Hypertension, 7*, 171-177.

Pickering, T.G., Shimbo, & Haas. (2006). Ambulatory blood pressure monitoring. *The New England Journal of Medicine, 354*, 2368-2374.

Pincus, A.L., & Ansell, E.B. (2013). Interpersonal theory of personality. In I. Weiner, T. Howard & J. Suls (Eds.), *Personality and social psychology* (2nd ed., pp. 141-159). Hoboken, NJ: John Wiley & Sons.

Prisant, L.M., Carr, A.A., Wilson, B., & Converse, S. (1990). Ambulatory blood pressure monitoring and echocardiographic left ventricular wall thickness and mass. *American Journal of Hypertension, 3*, 81-89.

Psaty, B. M., Furberg, C. D., Kuller, L. H., Cushman, M., Savage, P. J., Levine, D., ... Lumley, T. (2001). Association between blood pressure level and the risk of myocardial infarction, stroke, and total mortality: The cardiovascular health study. *Archives of Internal Medicine, 161*, 1183-1192.

Raikkonen, K., Matthews, K.A., Flory, J.D., Owens, J.F., & Gump, B.B. (1999). Effects of optimism, pessimism, and trait anxiety on ambulatory blood pressure and mood during everyday life. *Journal of Personality and Social Psychology, 76*, 104-113.

Renshaw, K.D., Blais, R.K., & Smith, T.W. (2010). Components of negative affectivity and marital satisfaction: The importance of actor and partner anger. *Journal of Research in Personality, 44*, 328-334.

Robins, R.W., Caspi, A., & Moffitt, T.E. (2000). Two personalities, one relationship: Both partners' personality traits shape the quality of their relationship. *Journal of Personality and Social Psychology, 79*, 251-259.

Robles, T.F., Slatcher, R.B., Trombello, J.M., & McGinn, M.M. (2013). Marital quality and health: A meta-analytic review. *Psychological Bulletin*, in press.

Rohrbaugh, M.J., Shoham, V., & Coyne, J.C. (2006). Effect of marital quality on eight-year survival of heart patients with heart failure. *American Journal of Cardiology, 98*, 1069-1072.

Rouest, A. M., Martens, E. J., de Jonge, P., & Denollet, J. (2010). Anxiety and risk of incident coronary heart disease: A meta-analysis. *Journal of the American College of Cardiology, 56*, 38-46.

Ruiz, J.M., Matthews, K.A., Schulz, R., & Scheier, M.F. (2006). Does who you marry matter for your health? Influence of patients' and spouses' personality on their partners' psychological well-being following coronary artery bypass surgery. *Journal of Personality and Social Psychology, 91*, 255-267.

Sadler, P., Ethier, N., & Woody, E. (2011). Interpersonal complementarity. In L. M. Horowitz & S. Strack (Eds.), *Handbook of interpersonal psychology: Theory, research, assessment, and therapeutic interventions* (pp. 123-142). Hoboken, NJ: Wiley & Sons, Inc.

Schum, J. (2003). Trait anger, anger expression, and ambulatory blood pressure: A meta-analytic review. *Journal of Behavioral Medicine, 26*, 395.

Shiffman, S, Stone, A.A., & Hufford, M.R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology, 4*, 1-32.

Shinagawa, M., Otsuka, K., Murakami, S., Kubo, Y., Cornelissen, G., Matsubayashi, K., Yano, S., … Halberg, F. (2002). Seven-day (24-h) ambulatory blood pressure

monitoring, self-reported depression and quality of life scores. *Blood Pressure Monitoring, 7*, 69-76.

Singer, J. D. (1998). Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models. *Journal of Educational and Behavioral Statistics, 23*, 323-355.

Smith, T.W. (2010). Conceptualization, measurement, and analysis of negative affective risk factors. In A. Steptoe (Ed.), *Handbook of behavioral medicine* (pp. 155-168). New York: Springer.

Smith, T. W., Baron, C. E., & Grove, J. L. (in press). Personality, emotional adjustment, and cardiovascular risk: Marriage as a mechanism. *Journal of Personality*.

Smith, T. W., & Brown, P. C. (1991). Cynical hostility, attempts to exert social control, and cardiovascular reactivity in married couples. *Journal of Behavioral Medicine, 14*, 581-592.

Smith, T. W., Cribbet, M. R., Nealey-Moore, J. B., Uchino, B. N., Williams, P. G., Mackenzie, J., & Thayer, J. F. (2011). Matters of the variable heart: Respiratory sinus arrhythmia response to marital interaction and associations with marital quality. *Journal of Personality and Social Psychology, 100*, 103-119.

Smith, T.W., & Cundiff, J.M. (2011). An interpersonal perspective on risk for coronary heart disease. In L.M. Horowitz & S. Strack (Eds.), *Handbook of interpersonal psychology: Theory, research, assessment, and therapeutic interventions* (pp. 471-489). Hoeboken, NJ: Wiley.

Smith, T.W., & Cundiff, J.M. (2013). On the aggregation of psychosocial risk factors: Models and methods. In S.R. Waldstein, W.J. Kop, & L.I. Katzel (Eds.), *Handbook of cardiovascular behavioral medicine* (pp. 471-490). New York: Springer.

Smith, T.W., & Gallo, L.C. (1999). Hostility and cardiovascular reactivity during marital interaction. *Psychosomatic Medicine, 61*, 436-445.

Smith, T.W., & Glazer, K. (2006). Hostility, marriage, and the heart: The social psychophysiology of cardiovascular risk in close relationships. In D.R. Crane & E.S. Marshall (Eds.), *Handbook of families and health: Interdisciplinary perspectives* (pp. 19-39). Thousand Oaks, CA: Sage.

Smith, T.W., Glazer, K., Ruiz, J.M., & Gallo, L.C. (2004). Hostility, anger, aggressiveness, and coronary heart disease: An interpersonal perspective on personality, emotion, and health. *Journal of Personality, 72*, 1217-1270.

Smith, T. W., & MacKenzie, J. (2006). Personality and risk of physical illness. *Annual Review of Clinical Psychology, 2*, 435-467.

Smith, T.W., & Ruiz, J.M. (2002). Psychosocial influences on the development and course of coronary heart disease: Current status and implications for research and practice. *Journal of Consulting and Clinical Psychology, 70*, 548-568.

Smith, T. W., & Traupman, E. K. (2012). Anger, hostility, and aggressiveness in coronary heart disease: Clinical applications of an interpersonal perspective. In R. Allan & J. Fisher (Eds.), *Heart and mind: The practice of cardiac psychology* (2nd ed., pp. 197-217). Washington, D.C.: American Psychological Association.

Smith, T. W., Traupman, E. K., Uchino, B. N., & Berg, C. A. (2010). Interpersonal circumplex descriptions of psychosocial risk factors for physical illness: Application to hostility, neuroticism, and marital adjustment. *Journal of Personality, 78*, 1011-1036.

Smith, T.W., Uchino, B.N., Berg, C.A., & Florsheim, P. (2012). Marital discord and coronary artery disease: A comparison of behaviorally defined discrete groups. *Journal of Consulting and Clinical Psychology, 80*, 87-92.

Smith, T.W., Uchino, B.N., Berg, C.A., Florsheim, P., Pearce, G., Hawkins, M. … Yoom, H. (2008). Self-reports and spouse ratings of negative affectivity, dominance and affiliation in coronary artery disease: Where should we look and who should we ask when studying personality and health? *Health Psychology, 27*, 676-684.

Smith, T. W., Uchino, B. N., Florsheim, P., Berg, C. A., Butner, J., Hawkins, M., . . . Yoon, H.-C. (2011). Affiliation and control during marital disagreement, history of divorce, and asymptomatic coronary artery calcification in older couples. *Psychosomatic Medicine, 73*, 350-357.

Smith, T. W., Uchino, B. N., MacKenzie, J., Hicks, A., Campo, R. A., Reblin, M., . . . Light, K. C. (2012). Effects of couple interactions and relationship quality on plasma oxytocin and cardiovascular reactivity: Empirical findings and methodological considerations. *International Journal of Pschophysiology, In Press*.

Suls, J., & Bunde, J. (2005). Anger, anxiety, and depression as risk factors for cardiovascular disease: The problems and implications of overlapping affective dispositions. *Psychological Bulletin, 131*, 260-300.

Traupman, E.K., Smith, T.W., Uchino, B.N., Berg, C.A., Trobst, K.K., & Costa, P.T. (2009). Interpersonal circumplex octant, control, and affiliation scales for the NEO-PI-R. *Personality and Individual Differences, 47*, 457-463.

Verdecchia, P. (2000). Prognostic value of ambulatory blood pressure: Current evidence and clinical implications *Hypertension, 35*, 844-851.

Watson, D., & Clark, L.A. (1984). Negative affectivity: The disposition to experience aversive emotional states. *Psychological Bulletin, 96*, 465-490.

Weiss, H., Beal, D. J., Lucy, S. L., & MacDermid, S. M. (2004). Constructing EMA studies with PMAT: The purdue momentary assessment tool user's manual. West Lafayette, IN: Purdue University, Military Family Research Institute.

Whisman, M.A., & Uebelacker, L.A. (2004). Psychopathology and marital satisfaction: The importance of evaluating both partners. *Journal of Consulting and Clinical Psychology, 72*, 830-838.

Wiggins, J. S. (2003). The interpersonal paradigm. In J. S. Wiggins (Ed.), *Paradigms of personality assessment* (pp. 63-92). New York, NY: The Guildford Press.